OPERATING AND SERVICE MANUAL

CHO LAB

LOAD CELLS

BLH ELECTRONICS

WALTHAM, MASSACHUSETTS 02154 • (617) 890–6700

PRINTED IN U.S.A. JAN 1975 TM - LOAD CELLS - 3

SECTION I
GENERAL INFORMATION

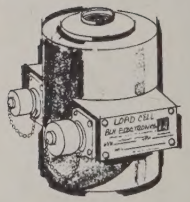
INTRODUCTION.

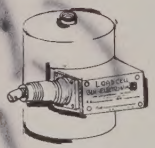
BLH Load Cells are transducers which translate changes in force or weight into proportional changes in output voltage. The sensitive element of the load cell is a precisely machined high strength steel device to which one or more sets of SR4 strain gages are bonded. These gages are electrically connected to form a fully active balanced Wheatstone bridge with additional resistors included in the circuit to maintain the bridge accuracy over a broad range of temperatures.

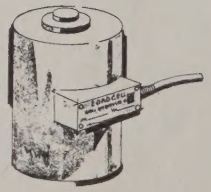
SPECIFICATIONS.

Specifications for general purpose, precision, calibration and high capacity load cells are listed in the table. The following notes are applicable to the specifications.

1. Symmetrical Circuit: The input resistance is split so that the resistance between either input lead and either output lead is within 1.75 ohms at 77°F. Does not apply to types C, U-1, U-1C.
2. Cell performance will not be impaired if safe overload rating is not exceeded.
3. All tolerances shown are maximum.
4. Output variance between tension and compression better than 0.5% available on special order.
5. Full scale output in compression is approximately 1.25% lower than full scale output listed.







Typical Load Cells

Table 1. Load Cell Specifications

Load Cells Type and Rated Capacity	Bridge	Electrical Connection	Input Terminal Resistance (1)	Output Terminal Resistance	Bridge Circuit	Electrical Excitation Recommended	Electrical Excitation Maximum	Rated Output	Calibration Accuracy	Temperature Effect on Zero Balance (15°F to 115°F)	Zero Balance	Temperature Effect on Rated Output (15°F to 115°F)	Nonlinearity	Hysteresis	Repeatability	Safe Overload Rating (2)
Type U3G1 10#-30#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.25% of 3 MV/V in ten. & comp.	± 0.0025% FS per °F	± 1% FS	± 0.005% of load per °F	0.25% FS in ten. & comp.	0.10% FS	0.10% FS	300% of rated capcity
Type U3G1 50#-300#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.25% of 3 MV/V in ten. & comp.	± 0.0025% FS per °F	± 1% FS	± 0.005% of load per °F	0.10% FS in ten. & comp.	0.05% FS	0.05% FS	500% of rated capacity
Type U3G1 500#-10,000#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.25% of 3 MV/V in ten. & comp.	± 0.0025% FS per °F	± 1% FS	± 0.005% of load per °F	0.10% FS in ten. & comp.	0.02% FS	0.02% FS	150% of rated capacity
Type C2G1 20,000#-200,000#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	2 MV/V Input	0.25% of 2 MV/V in compression	± 0.0025% FS per °F	± 1% FS	± 0.005% of load per °F	0.05% FS in comp.	0.02% FS	0.02% FS	150% of rated capacity
Type T2G1 20,000#-200,000#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	2 MV/V Input	0.25% of 2 MV/V in tension	± 0.0025% FS per °F	± 1% FS	± 0.005% of load per °F	0.10% FS in ten. & comp.	0.02% FS	0.02% FS	150% of rated capacity
Type U3G2 50#-300#	350Ω Double	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.25% of 3 MV/V in ten. & comp.	± 0.0025% FS per °F	± 1% FS	± 0.005% of load per °F	0.10% FS in ten. & comp.	0.05% FS	0.05% FS	500% of rated capacity
Type U3G2 500#-250,000#	350Ω Double	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.25% of 3 MV/V in ten. & comp.	± 0.0025% FS per °F	± 1% FS	± 0.005% of load per °F	0.10% FS in ten. & comp.	0.02% FS	0.02% FS	150% of rated capacity
Type C3P1 50#-300#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.10% of 3 MV/V in compression	± 0.0015% FS per °F	± 1% FS	± 0.0008% of load per °F	0.05% FS in comp. 0.10% FS in ten.	0.05% FS	0.05% FS	500% of rated capacity
Type C3P1 500#-10,000#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.10% of 3 MV/V in compression	± 0.0015% FS per °F	± 1% FS	± 0.0008% of load per °F	0.05% FS in ten. & comp.	0.02% FS	0.02% FS	150% of rated capacity
Type C2P1 20,000#-200,000#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	2 MV/V Input	0.10% of 2 MV/V in compression	± 0.0015% FS per °F	± 1% FS	± 0.0008% o load per °F	0.05% FS in compression	0.02% FS	0.02% FS	150% of rated capacity

Table 1. Specifications (Cont'd.)

Load Cells Type and Rated Capacity	Bridge	Electrical Connection	Input Terminal Resistance (1)	Output Terminal Resistance	Bridge Circuit	Electrical Excitation Recommended	Electrical Excitation Maximum	Rated Output	Calibration Accuracy	Temperature Effect on Zero Balance (15°F to 115°F)	Zero Balance	Temperature Effect on Rated Output (15°F to 115°F)	Nonlinearity	Hysteresis	Repeat-ability	Safe Overload Rating (2)
Type C3P2B 50#-300#	350Ω Double	Bendix Connector	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.10% of 3 MV/V in compression	± 0.0015% FS per °F	± 1% FS	± 0.0008% of load per °F	0.05% FS in comp. 0.10% FS in ten.	0.05% FS	0.05% FS	500% of rated capacity
Type C3P2B 500#-250,000#	350Ω Double	Bendix Connector	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.10% of 3 MV/V in compression	± 0.0015% FS per °F	± 1% FS	± 0.0008% of load per °F	0.05% FS in ten. & comp.	0.02% FS	0.02% FS	150% of rated capacity
Type T3P1 50#-300#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.10% of 3 MV/V in tension	± 0.0015% FS per °F	± 1% FS	± 0.0008% of load per °F	0.05% FS in ten. 0.10% FS in comp.	0.05% FS	0.05% FS	500% of rated capacity
Type T3P1 500#-10,000#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.10% of 3 MV/V in tension	± 0.0015% FS per °F	± 1% FS	± 0.0008% of load per °F	0.05% FS in ten. & comp.	0.02% FS	0.02% FS	150% of rated capacity
Type T2P1 20,000#-200,000#	350Ω Single	10 Ft. Cable	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	2 MV/V Input	0.10% of 2 MV/V in tension	± 0.0015% FS per °F	± 1% FS	± 0.0008% of load per °F	0.05% FS in ten. & comp.	0.02% FS	0.02% FS	150% of rated capacity
Type T3P2B 50#-300#	350Ω Double	Bendix Connector	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.10% of 3 MV/V in tension	± 0.0015% FS per °F	± 1% FS	± 0.0008% of load per °F	0.05% FS in ten. 0.10% FS in comp.	0.05% FS	0.05% FS	500% of rated capacity
Type T3P2B 500#-250,000#	350Ω Double	Bendix Connector	350 ± 3.5	350 ± 5.0	Constant Voltage	12 Volts AC-DC	20 Volts AC-DC	3 MV/V Input	0.10% of 3 MV/V in tension	± 0.0015% FS per °F	± 1% FS	± 0.0008% of load per °F	0.05% FS in ten. & comp.	0.02% FS	0.02% FS	150% of rated capacity
Type C 2000# - 200,000#	120Ω Single	10 Ft. Cable	120.0 ± 0.5	117.5 ± 1.0	Constant Voltage	6 Volts AC-DC	10 Volts AC-DC	2MV/V Input	0.25% of 2MV/V in compression	± 0.0025% FS per °F	± 2.5% FS	± 0.005% of load per °F	+0.25% FS in compression	0.25% FS	0.05% FS	150% of rated capacity
Type CXX 500# - 2000#	120Ω Single	10 Ft. Cable	120.0 ± 0.5	117.5 ± 1.0	Constant Voltage	6 Volts AC-DC	10 Volts AC-DC	2MV/V Input	0.10% of 2MV/V in compression	± 0.0015% FS per °F	± 2.5% FS	± 0.0008% of load per °F	± 0.10% FS in compression	.05% FS	0.05% FS	150% of rated capacity
Type CXX 5000# - 200,000#	120Ω Single	10 Ft. Cable	120.0 ± 0.5	117.5 ± 1.0	Constant Voltage	6 Volts AC-DC	10 Volts AC-DC	2MV/V Input	0.10% of 2MV/V in compression	± 0.0015% FS per °F	± 2.5% FS	± 0.0008% of load per °F	+0.20% FS in compression	.05% FS	0.05% FS	150% of rated capacity

Table 1. Specifications (Cont'd.)

Load Cells Type and Rated Capacity	Bridge	Electrical Connection	Input Terminal Resistance (1)	Output Terminal Resistance	Bridge Circuit	Electrical Excitation Recommended	Electrical Excitation Maximum	Rated Output	Calibration Accuracy	Temperature Effect on Zero Balance (15°F to 115°F)	Zero Balance	Temperature Effect on Rated Output (15°F to 115°F)	Nonlinearity	Hysteresis	Repeatability	Safe Overload Rating (2)
Type U-1 50# - 2000#	120 Ω Single or Double	10 Ft. Cable	120.0 ± 0.5	117.5 ± 1.0	Constant Voltage	6 Volts AC-DC	10 Volts AC-DC	2MV/V Input	0.25% of 2MV/V in both ten. & com.	± .0025% FS per °F	±2.5% FS	±0.005% of load per °F	±0.10% FS in both tension and compression	.10% FS	0.05% FS	150% of rated capacity
Type U-1 5000# - 200,000#	120 Ω Single or Double	10 Ft. Cable	120.0 ± 0.5	117.5 ± 1.0	Constant Voltage	6 Volts AC-DC	10 Volts AC-DC	2MV/V Input	0.25% of 2MV/V in tension (5)	± 0.0025% FS per °F	±2.5% FS	±0.005% of load per °F	+0.2% FS in compression —0.17% FS in tension	.10% FS	0.05% FS	150% of rated capacity
Type C-1C 24,000# - 240,000#	120 Ω Single	15 Ft. Cable	120.0 ± 0.5	117.5 ± 1.0	Constant Voltage	6 Volts AC-DC	10 Volts AC-DC	2.4 MV/V Input	0.25% of 2.4MV/V in compression	± 0.0025% FS per °F	±2.5% FS	±0.005% of load per °F	+0.25% FS in compression	.10% FS	0.05% FS	125% of rated capacity
Type U-1C 60# - 2400#	120 Ω Single	15 Ft. Cable	120.0 ± 0.5	117.5 ± 1.0	Constant Voltage	6 Volts AC-DC	10 Volts AC-DC	2.4 MV/V Input	0.25% of 2.4MV/V in both ten. & com.	± 0.0025% FS per °F	±2.5% FS	±0.005% of load per °F	±0.10% FS in both tension and compression	.10% FS	0.05% FS	125% of rated capacity
Type U-1C 6000# - 240,000#	120 Ω Single	15 Ft. Cable	120.0 ± 0.5	117.5 ± 1.0	Constant Voltage	6 Volts AC-DC	10 Volts AC-DC	2.4 MV/V Input	0.25% of 2.4MV/V in tension (5)	± 0.0025% FS per °F	±2.5% FS	±0.005% of load per °F	—.20% FS in tension +0.25% FS in compression	.10% FS	0.05% FS	125% of rated capacity

Insulation Resistance 5000 megohms bridge to ground; 5000 megohms bridge to bridge; 2000 megohms cable shield to ground; 2000 megohms bridge to cable shield

HIGH CAPACITY COMPRESSION LOAD CELLS TYPE C2P1 or C2P2

RATED CAPACITY: 0-300,000 through 0-1,500,000 POUNDS

SPECIFICATIONS

With the following exceptions, the high capacity C2P1 or C2P2 is identical in performance to lower capacity C2P1 or C2P2 cells. (See pages 10-11).

SPAN CALIBRATION

2 mv/v ± 0.25% in compression.

HIGH CAPACITY UNIVERSAL LOAD CELLS TYPE T2P1 or T2P2

RATED CAPACITY: 0-300,000 through 0-1,500,000 POUNDS

SPECIFICATIONS

With the following exceptions the high capacity T2P1 or T2P2 is identical in performance to lower capacity T2P1 or T2P2 load cells.

SPAN CALIBRATION

Tension

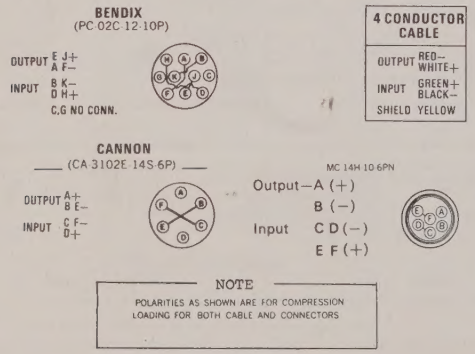
300K : 2 mv/v ±0.25% FS
500K and Up : 2 mv/v ±0.50% FS

Variance between Tension and Compression: Within 0.5% FS

ELECTRICAL CONNECTIONS.

Load cells are supplied with ten feet of 4-conductor color coded shielded cable. Cells with the suffix "B" are equipped with Bendix connectors; "C" indicates Cannon. Calibration load cells are supplied with fifteen feet of cable terminating in an AN connector. Bendix and Cannon connectors and cables of other types and lengths are available for most load cells on special order. The cable color code and the pin designations are listed in the table for electrical connections.

Electrical Connections



LOAD CELL ACCESSORIES.

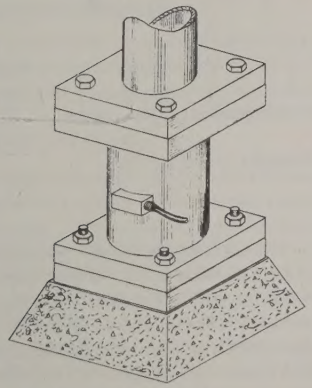
The load cell accessories described and illustrated include some of the more commonly used types. For additional information concerning these or other special requirements, contact BLH.

MOUNTING PLATES consist of a mild steel plate which is attached directly to the load cell base, and a hardened steel plate which acts as a bearing surface for the load button. Both plates are equipped with mounting holes and can be attached to the supporting structure or platform.

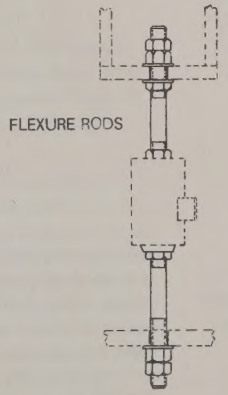
ADJUSTABLE LEVELING PLATES are similar to mounting plates except that the base plate mounting contains three leveling screws instead of the mounting holes. These screws, which protrude from the bottom of the base plate, can be set into shallow counterbored or countersunk holes in a second base plate (not supplied) to provide non-slip 3-point leveling for the attached load cell.

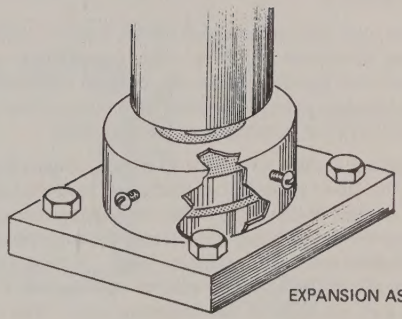
FLEXURE RODS are steel rods used as linkages to interconnect the load cell and weigh tank or platform to the supporting structure in a tension weighing arrangement.

EXPANSION ASSEMBLIES are sliding bearing units which have an inherently low coefficient of friction and are capable of lateral movement up to ±3/8" depending upon capacity. These bearing units are designed to minimize sideloads caused by thermal expansion or contraction of the structure supported by compression load cells.

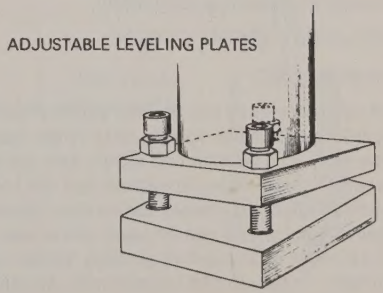


MOUNTING PLATES





EXPANSION ASSEMBLY

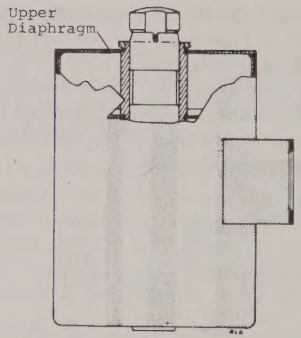


SECTION II
INSTALLATION

GENERAL

The load cell is a rugged device built to withstand long strenuous service, when operation is within the specified limits. However, certain precautions must be taken to prevent damage which can affect the operation and the accuracy of the load cell.

The top section of a BLH load cell (connecting the case to the inner threaded or radiused load application point) is a steel diaphragm. This diaphragm provides radial support to the force sensitive element within the cell and also acts as a moisture seal. A dent or puncture can affect the linearity and/or calibration of the cell, as well as destroy the hermetic seal. Use care when installing or operating load cells.



DIAPHRAGM TYPE LOAD CELL

MECHANICAL INSTALLATION.

Tension Service.

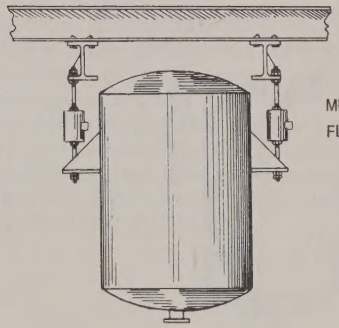
Load cells designed for tension service are equipped with internal threads at both ends of the load cell. These cells can be mounted either side up and connected between the supporting structure and the load by means of two threaded alloy steel rods called flexure rods. A single flexure rod can be used where one end of the load cell will be connected directly to the supporting structure. Flexure rod lengths are calculated to provide the degree of flexibility necessary for minimizing side load effect on the load cells. On installations where short rods must be used, insert a flexible connector such as a spherical end rod as close to the load cell as possible. When assembling flexure rods to load cells engage at least 90% of the load cell thread but DO NOT allow the rod to bottom in the threaded hole of the cell.

The lengths of flexure rods used on multiple load cell installations should be adjusted so that all load cells will carry approximately the same load. In all cases side loading must be limited to less that 6% of rated cell capacity to ensure satisfactory performance. Flexure rod specifications are listed in the bulletin "accessories for Load Cells", available on request from BLH.

Compression Service.

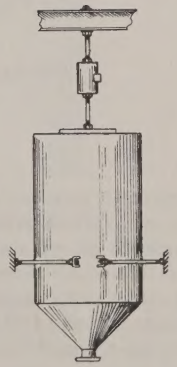
Load cells used for compression service are usually mounted in a vertical position. A flat base plate which has parallel ground surfaces should be placed beneath the cell to ensure uniform distribution of the load reaction into the load cell.

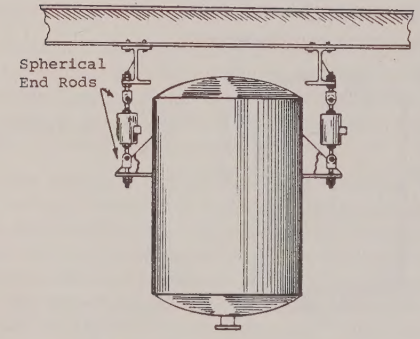
Load cells contain one or more threaded mounting holes which can be used for attaching the cell to the base plate. The location and dimension of these holes are shown in the Load Cell catalog. Additional mounting holes can be drilled in most cells containing only one mounting hole. The dimensions of areas in which these holes can be drilled and the maximum hole depths are included in the dimensional drawings. DO NOT drill mounting holes in load cells where this information is not given.



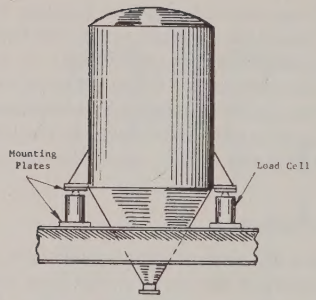
MULTIPLE CELL
FLEXURE ROD ARRANGEMENT

SINGLE CELL
FLEXURE ROD ARRANGEMENT





SPHERICAL END ROD INSTALLATION

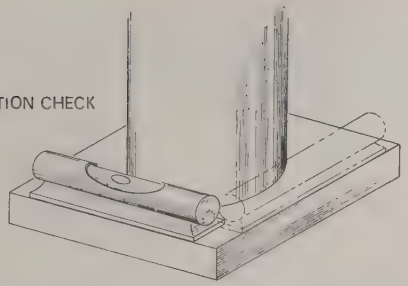


MOUNTING PLATE INSTALLATION

An additional plate called a bearing plate is required between the load cell button and the load. This plate also has parallel ground surfaces and hardened to C-40 Rockwell (370-Brinell) to resist penetration by the load button. The bearing plate thickness is sufficient to prevent cracking under concentrated loads. The area of these plates varies according to the diameter of the load cell in use.

The base plate attached to the load cell can be used as a reference surface for checking the vertical position of the load cell during installation. Place a level on the base plate as shown in the illustration. Cell must be vertical within $1/2^{o}$ for general use or within $1/4^{o}$ where higher accuracy is required. Make certain that the screws used to secure the base plate to the foundation or, if the cell is mounted base up, to the support structure are properly tightened before checking the cell position. Check the same surface at an adjacent side (90^{o} from first measurement).

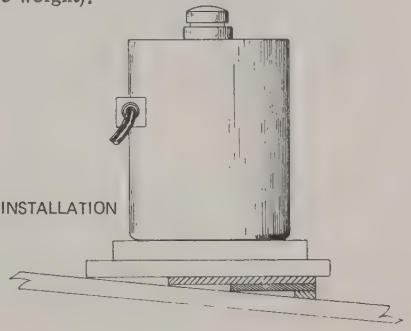
LOAD CELL POSITION CHECK



If the cell is not vertical (within tolerance) in both directions, it will be necessary to place shims between the base plate and the foundation for correction. Stagger the shims as shown in the figure to eliminate the need for costly wedge-shaped shims. After shims are positioned, tighten the base plate mounting screws securely and recheck the cell position by placing the level at two adjacent surfaces of the base plate as previously described. If cell position is still unsatisfactory, loosen base plate mounting screws and add or remove shim material as necessary. Continue this process until the cell is correctly positioned. Special adjustable leveling plates are also available for adjusting cell position. If the cell is being installed with an expansion assembly, follow the instructions with that unit.

Load cells must be installed in such a manner that each cell will carry not more than 120% of its rated load, where a number of load cells are used to sense the weight or force applied to a tank, bin, platform, scale, test stand, etc. Before applying any live load to the cells, check the output of each cell with a readout instrument such as a BLH Model 352A Transducer Indicator, or equivalent. Every cell in use should indicate some load (not less than 5% of tare weight).

TYPICAL SHIM INSTALLATION

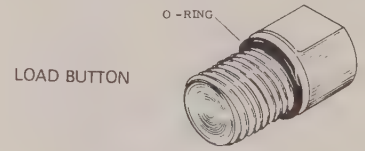


If the output of the load cell is zero during this test, use a feeler gage to measure any existing gap between the load button of the cell and the bearing plate. Note this gap measurement. Raise the structure at the cell to be ad-

justed with a hydraulic jack or other suitable means. Unfasten the bearing plate from the support structure or, if the cell was mounted base up, from the foundation. If the cell under adjustment was in contact with the bearing plate but indicated low output, insert a trial amount of shim (.002" -.003") under the bearing plate. For cells where a gap existed, use a shim thickness equivalent to the gap measurement previously recorded plus .002" - .003". Secure bearing plate. Release jack or other lifting device and recheck output of each load cell. Repeat this procedure, if necessary, until each load cell supporting the structure indicates a load of not less than 5% of tare weight.

LOAD BUTTONS. Universal and tension load cells used for compression service must be equipped with a load button (not supplied) for proper transmission of the compression load to the cell. The head of this special bolt-like device has a spherical radius identical to that found at the top center of a compression load cell. The threaded end of this button is designed to engage the threaded end of the load cell.

Load buttons designed for use on older type load cells are equipped with a setscrew used in conjunction with notches machined at the mouth of the load cell thread to prevent the button from turning. Universal and tension load cells manufactured after Nov. 1970, however, are no longer notched.



Load buttons designed for use on all capacities of the latest load cells include an o-ring installed in a groove between the load button head and the threaded section as shown in the figure. The purpose of the o-ring is to prevent the load button shoulder from bottoming on the surface at the mouth of the thread and to provide a light locking pressure to keep the button from turning, once installed.

Installation of o-ring equipped load buttons consists of simply turning the button into the cell until the o-ring contacts the surface at the mouth of the cell then turning the button a fraction more to lightly compress the ring. Some types of compression load cells are also equipped with a removable load button supplied with the cell. Check that this button is properly adjusted before installing the cell.

HORIZONTAL INSTALLATIONS. All types of load cells can be mounted in a horizontal position provided that load is applied to the primary axis of the load cell, and that side loads do not exceed 6% of rated cell capacity. Alignment procedures previously described will apply in most cases.

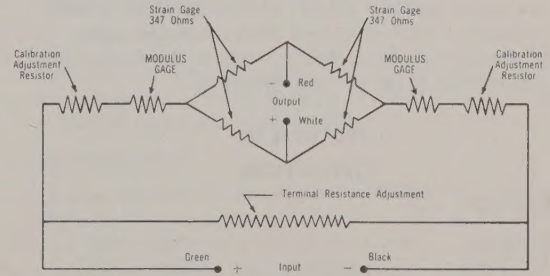
Electrical Installation.

The tinned lead ends of the load cell cable can be soldered directly to terminal blocks of a readout instrument or junction box. These leads can also be fitted with solderless terminals or electrical connectors, where removable connections are desired. Connector type load cells are supplied with a mating connector half for use with interconnecting cable (not supplied). Use a high grade 60/40 solder and rosin flux, where solder connections are used. Thoroughly clean all joints before and after soldering.

Recommended excitation voltages for 120Ω and 350Ω load cells are listed in the specifications. Bridge polarity can be reversed, if desired, by reversing the Black and Green (input) leads or the Red and White (output) leads. Refer to the schematic drawing.

Protect the entire length of load cell cable with conduit, where practical. Conduit can be attached to the 1/2"-14 NPT nipple located on the cable entry box of cable equipped load cells.

The use of a water-proof junction box is recommended where cable leads terminate outside an instrument case at outdoor installations. Moisture can be prevented from entering the lead ends of the load cell cable by filling the junction box with a potting compound. A special explosion-proof junction box should be used where explosive vapors or materials are present.



NOTES:
Modulus Gages vary with temp. to compensate for thermo-elastic coefficient of pickup metal.
Polarity as shown is for compression loading.
The resistance from either output arm to either input arem is equal within 1.75 ohms at 77 degrees F (350 ohm bridge).

BRIDGE SCHEMATIC DIAGRAM

LINE LOSSES.

Standard load cells are calibrated with a 10-ft length of 4-conductor (#20AWG) shielded cable. Precision load cells are also calibrated with ten feet of cable but are compensated to maintain output level within specification with up to 25 feet of #20AWG cable. Extension cable which increases the overall length of a load cell cable will cause a small drop in output voltage. This loss, due to the increased loop resistance of the output leads (Red and White), amounts to approximately 0.82%/Ω for 120Ω cells, and 0.28%/Ω for 350Ω cells. Compensate for output losses by recalibrating the readout instrument for the actual load cell output, where higher accuracies are required. The output loss from increased cable length can also be calculated in terms of the readout in use and applied to the reading displayed.

SECTION III
OPERATION

OPERATION.

Preliminary.

The load cell(s) should be tested with the associated readout or instrument system, after installation. This test will serve as a check of the mechanical and electrical installation as well as overall system performance. Instruments used with load cells should be equipped with a zero set control fro adjusting the no-load output of the cell to zero. A zero set with sufficient range to cancel output resulting from tare weight on the cell plus 5% of rated cell output will be adequate in most cases.

OPERATING NOTES.

Temperature.

Load cells perform best when operated within a temperature envelope of +15°F to +115°F, compensated. Maximum operating temperature with minimum change in performance is 0°F to +150°F. Load cells can operate intermittently at temperatures up to 180°F. However, the zero output of cells operating at these higher temperatures must be checked frequently. BLH high temperature load cells can operate at temperatures up to 425°F. When ambient temperature at the load cell exceeds the safe temperature range, special precautions must be taken to insure that actual cell temperature is held within the specified limits. These precautions are necessary whether or not the cell is being operated.

All load cells used on a multiple load cell arrangement should be operated at a uniform temperature within 5° where high accuracy is required.

Load.

Most load cells can be loaded up to 150% of rated load

with no adverse effects. Cells which contain integral overload stops such as the 30# type U3G1 can be overloaded up to 300% of rated load. 50# to 300# types C3, T3, and U3 load cells, which fall into this same category, can be overloaded as much as 500% of rated load.

CAUTION - Overloads in excess of Safe Overload Rating may permanently effect the accuracy and performance of the load cell.
Shock loads having peak values in excess of 120% of rated cell capacity may also affect calibration and should be avoided.

SECTION IV

MAINTENANCE

CALIBRATION.

Load cells are carefully checked and calibrated at the factory before shipment. The accuracy of the instruments and standards used for these checks are directly traceable to the National Bureau of Standards. A certificate of calibration and traceability is furnished with each load cell supplied by BLH. This certificate defines the direction of loading, the full scale output (mV/V), terminal resistance, zero balance (mV/V), and insulation resistance of the particular cell. The data included in this certificate can be used as a reference where independent calibration checks are performed.

Load cell calibration can be accurately checked by applying a known load to the cell and then comparing the output with the original data on the calibration certificate. Linearity of a load cell can be checked by applying the known load in smaller increments and recording the output at each load point. The deviation between these points and straight line performance represents linearity error. Load cell calibration should be checked whenever the cell has been accidently overloaded beyond its safe overload rating. The load cell cannot be changed through external adjustments and any load cell displaying calibration error should be returned to BLH for service.

MAINTENANCE.

Load cells do not require any maintenance other than the application of touch up paint to areas which become scratched or chipped during service.

Troubleshooting.

To determine the cause of erratic or incorrect operation of the measuring system, make the following checks:

a. Check instrument power and fuses.

b. Check that the connections to the instrument are correct and tight.

c. Check instrument performance independently following recommended procedure.

d. Check continuity of interconnecting leads.

e. Check junction box connections (where used).

f. Check resistance between a lead of the interconnecting cable and ground with a 50-volt megohmmeter. Resistance should be greater than 100MΩ.

g. Disconnect the load cell cable leads from the instrument or junction box. Measure the resistance between the input leads and between the output leads. Resistance should be as specified. Ohmmeter used should not apply more than 10 volts to the load cell bridge.

h. Check insulation resistance between a lead of the cable and the case with a megohmmeter. Resistance should be greater than 100MΩ.

i. Check insulation resistance between the cable shield and the load cell case with a megohmmeter. Resistance should be 100MΩ or greater.

Resistance readings other than those listed in the specifications indicate a failure within the load cell. DO NOT attempt to repair a load cell. Faulty load cells require factory service. Contact the local sales office or BLH directly for RETURN AUTHORIZATION FORM 862, which must accompany each load cell returned for service. Upon examination of the cell at the factory a full report on the cell condition with a quotation on repair cost and delivery time will be submitted to the customer.